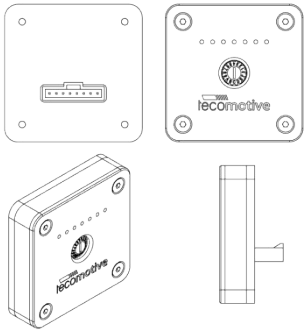
Tecomotive - tinyCWA - User Manual
Charge Cooler Special

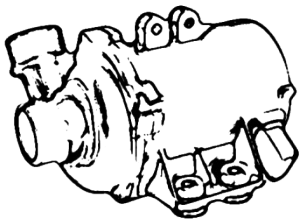
Overview



Contents

- tinyCWA controller
- Fuse holder
- Fuses (7.5A/15A/30A)
- Connector 8 pin (controller)
- Connector 3 or 4 pin (water pump)
- Connector 2 pin (temperature sensor)
- Temperature sensor M8 or M12
- Set of screws (controller mounting) (see next page)

Introduction



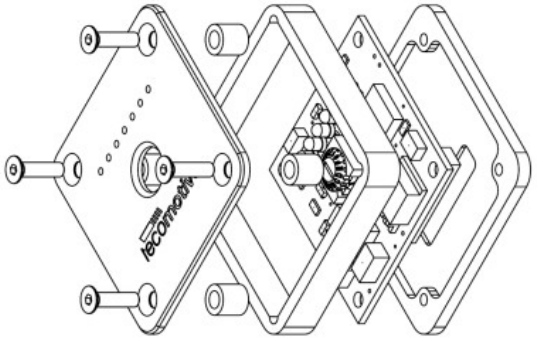
The Pierburg CWA200 was the first electronic water pump for line production introduced by BMW in 2004. They and others are now widely available in used cars and the aftermarket and got many advantages over conventional mechanical pumps. Some of which are the freedom of installation and the independence of engine revulations.
The “tinyCWA” controller can control all CWA type pumps in the appropriate manner.

Operation

When activated the controller is measuring the coolant temperature and the rate of increase with the connected temperature sensor. With this data it then calculates the appropriate water flow and sends a signal to the pump where the internal pump electronics then set it to the right speed. This way you will always have the right pump speed for any circumstances.

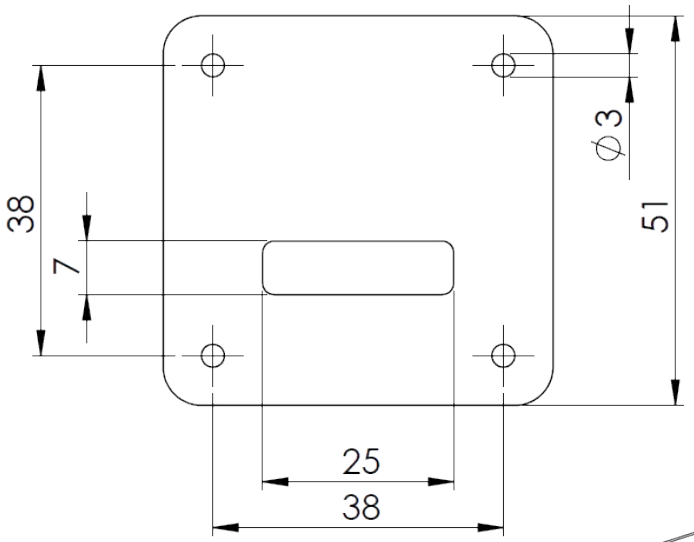
Features

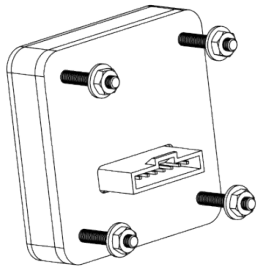
- Simple to set up with only one rotary switch
- Choose your favorite target temperature in twelve steps from 0°C to 55°C
- LED display shows the current pump speed or rough coolant temperature
- Compact and robust anodized aluminum case
- Relay output for the radiator fan (recommend to use)
- Delayed shutdown of the pump and the fan after ignition turned off
- Manually control the pump speed (e.g. for bleeding or testing)



Installation

Installation drawing in Millimeters





Changing the screws

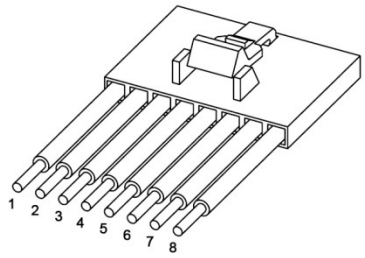
To mount the controller on a front panel you can change the four case screws (M3) to the longer ones which come with the kit.
Please only change one at the time. There are little spacers inside the case which can get out of place without the screw. (See the picture at the last page)
Of course the controller can be mounted anyway you like. (E.g. with double sided tape or zip ties …)

Connection

We made the connection as easy and intuitive as possible. So in general that means that the same color cables are meant to connect to each other. A detailed connection diagram can be found on the last page.
After you installed all the wires you can then plug in all the connectors.

Even though the CWA200 is electronically regulated to a maximum load of 15 ampere you should always use the fuse / fuse holder that comes with the kit.

Connector: Controller (8 pin)

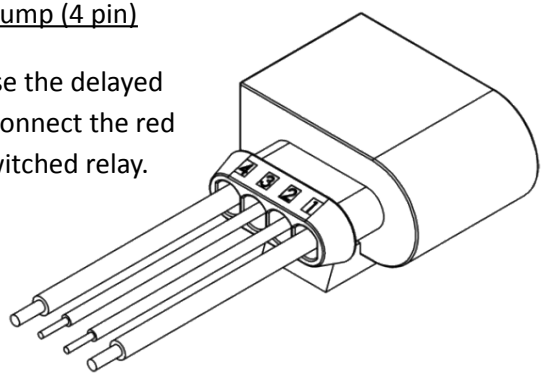


Info: If you do not want to use the delayed shutdown function you can connect the red wire (pin 2) to the ignition switch, too.

Attention: The radiator fan relay output can only handle a maximum of 0.6 amps! (That means a minimum of 25 ohms coil resistance)

PIN	Color	Connection
1	Black	Ground GND -
2	Red	Battery +
3	Yellow	Ignition key +
4	Black	Additional ground GND for temperature sensor
5	Orange	Signal wire temperature sensor
6	Blue	Radiator fan relay output
7	Grey / Red	Signal wire water pump
8	Grey / Black	Ground wire water pump

CWA200 Connector: Water pump (4 pin)



Info: If you do not want to use the delayed shutdown function you can connect the red wire (pin 1) via an ignition switched relay.

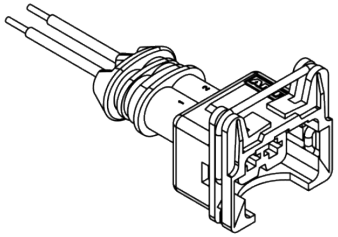
Attention: The main current flows through pin 1 and pin 4.

Fuses:
(CWA50 7.5 amps / CWA200 15 amps / CWA400 30 amps)
Please only use wires which are able to handle the current!

PIN	Color	Connection
1	Red	Battery +
2	Grey / Red	Signal wire from controller
3	Grey / Black	Ground wire from controller
4	Black	Ground GND

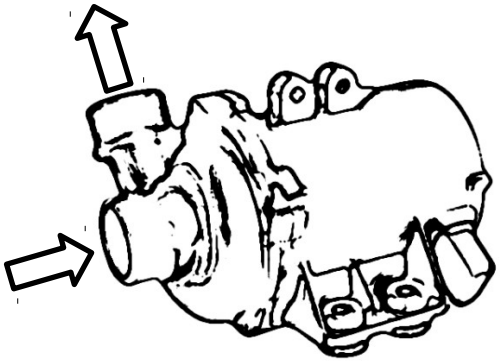
Connector: Temperature sensor (2 pin)

PIN	Color	Connection
1	Orange	Signal
2	Black	Ground GND



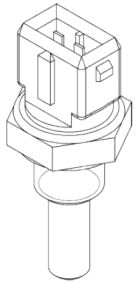
Water pump installation

In and outlet of the pump are shown in the picture.
To get a decent coolant circulation the pump should suck the water out of the bottom radiator port and then pump it back into the engine/intercooler.
Also it is recommended to mount the pump as low as possible.



Attention: Please only mount the pump with appropriate rubber dampers because high vibration can damage the internal electronics!

Placing the temperature sensor



The temperature sensor is a normal Bosch type NTC used in many European line production cars. It's got an M12x1.5 thread and a copper ring for proper sealing.
(M8 Sensor for the CWA50 kit)

Attention: You should position the sensor at the hottest place of your cooling system.

Basic settings

The controller is pre-programmed in a way that should work for most of the cars right out of the box.

The only things you need to decide is what target temperature and program you want to run. (See the list beside)
Turn the rotary switch to the associated character. Done.

Using the rotary switch

Right in the center of the controller's front panel you'll find the rotary switch. By turning it to a specific character you are able to set up all the things the controller can do.

The character that points to the bottom is the currently selected one.
(You will see a little white dot by looking closely.)

Also it helps to use a little screwdriver for turning.

Rotary switch position's

You can turn the switch to 16 different positions. Every one of them stands for a different program / target temperature.

Just choose the one that's best for your application from the following list.

If you don't know what target temperature would be the best for your engine, just choose one which is roughly the same as the opening temperature of the engines thermostat.

Program list

Pos.	Mode	Target Temperature	Description
0	Test mode	-	Pump Off / Fan Off
1	Test mode	-	Pump to min. rev. / Fan Off
2	Test mode	-	Pump to 50% / Fan Off
3	Test mode	-	Pump to 100% / Fan On
4	Normal mode	0°C	At 5° Celsius over target the radiator fan will come on. The controlled temperature range is plus minus 5°C / 9°F from the current target temperature.
5	Normal mode	5°C	
6	Normal mode	10°C	
7	Normal mode	15°C	
8	Normal mode	20°C	
9	Normal mode	25°C	
A	Normal mode	30°C	
B	Normal mode	35°C	
C	Normal mode	40°C	
D	Normal mode	45°C	
E	Normal mode	50°C	
F	Normal mode	55°C	

General Information

In contrast to most stock systems the controller uses the cooling fan not only as an emergency but actively and early.
This is intended and strongly recommended to use.

If you turn the engine off while the coolant temperature is in the controlled range, the controller will perform a delayed shutdown of the pump and fan.
This is a two-step process that runs for a maximum of two minutes.
You find more information on this under "Advanced settings / Delayed shutdown" later in this manual.

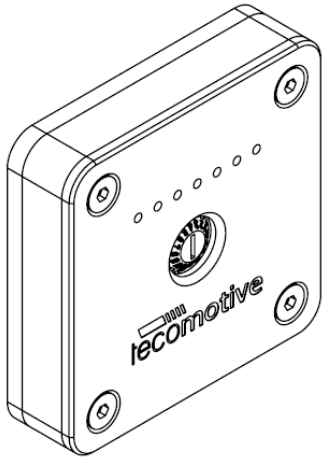
The Test mode

There is no active pump / temperature regulation in this mode.
With the ignition key on, the controller will set the pump to a certain speed and will hold that until the ignition is turned back off.

This mode can be used for e.g. the first tests or bleeding purposes.

Rotary switch:

- **„0“** – The **pump and** the **radiator** fan are switched **off**.
- **„1“** – The **pump** will run with the setup **minimum pump value**.
  (see „ Advanced settings / Minimum pump value“)
  The **radiator fan** is turned **off**.
- **„2“** – The **pump** will run at **50%**
  The **radiator fan** is turned **off**.
- **„3“** – The **pump** will run at **full speed**.
  The **radiator fan** is turned **on**.



The Normal mode

In warm up condition (target minus 10°C / 18°F) the controller will run the pump with the setup minimum pump value.
(See “Advanced settings / Minimum pump value” for this.)

Once the coolant temperature reaches the controlled range (target plus minus 5°C / 9°F), the controller will regulate the pump speed / temperature dynamically.

Advanced settings

If the preset values the controller is using are not suitable for your application you are able to change the important ones with some advanced setup procedures.

The controller will then store all the changes to its onboard memory so that they are safe even if it loses power.

<u>The Setup procedure</u>

To change any of the advanced settings you have to put in a four digit code under a certain condition with the rotary switch.

The code uses the numbers 0 – 4 – 2 – … followed by a fourth digit that represents one of the following settings.

Setting / Code:

- 0 – 4 – 2 – **0** >> Changes the minimum pump value
- 0 – 4 – 2 – **3** >> Switches the LED display
- 0 – 4 – 2 – **6** >> Switches the delayed shutdown feature on or off
- 0 – 4 – 2 – **9** >> Switches the boost feature on or off
- 0 – 4 – 2 – **F** >> Reset to factory settings

The Setup procedure step by step:

1. Disconnect the main battery connection from the controller. (e.g. by pulling the controllers plug)
2. Turn the rotary switch to the first digit of the code „0“.
3. Reconnect the main battery connection to the controller.
    a. The LED in the middle lights up.
4. Turn the rotary switch to the second digit of the code „4“.
    a. You got a 10 second time window to do so.
    b. After those 10 seconds another LED will light up.
5. Turn the rotary switch to the third digit of the code „2“.
    a. You got a 10 second time window to do so.
    b. After those 10 seconds a third LED will light up.
6. Turn the rotary switch to the forth digit of the code „0-F“.
    a. You got a 10 second time window to do so.
    b. After those 10 seconds the LED’s are going to flash once.
7. Now you have to turn the rotary switch to the new value of that particular setting. (You find a description of that in the relevant chapter in this manual)
    a. You got a 20 second time window to change the setting.
    b. After those 20 seconds the LED’s will flash several times to show you that the new value was saved correctly.
    c. Afterwards the controller goes into normal operation.

Info: The ignition key does not have to be turned on for this.

Tip: If you plan on changing many settings you should consider putting a simple on off switch between the battery wire of the controllers plug and your actually battery + line.

Tip: Write down the 4 digit code followed by the new settings value.
This way you have a nice readable 5 digit code for each change.

Minimum pump value – **Code „0“**

In this setting you can change the minimum speed of the pump the controller will allow.

(CWA200) The factory setting here is 600 revolutions or about 15 liters per minute. The pump itself is able to deal with speeds from 18 up to 4500 revolutions per minute. This relates to a flow rate from 0.5 to 116 liters per minute or 8 to 1839 gallons per hour.

Keep in mind that there should always be enough flow so the temperature sensor is able to measure the coolant temperature correctly.
The right amount auf minimum flow is tricky to find out. Feel free to experiment a little with this setting but always observe the actual temperature.

You can damage your engine permanently if it gets to hot!

Possible settings: (CWA200)

In step 7 of the setup procedure, just choose one of the settings beside.

E.g.: If you want to change the setting to 600 rpm
the 5 digit code is:
“0” – “4” – “2” – “0” – “3”
(0420 for this menu and 3 for the new setting)

Rotary switch position	rpm	l/min	gal/h
0	18	0,5	8
1	150	4	63
2	340	9	143
3	600	15	238
4	1000	25	396
5	1500	38	602
6	2000	52	824
7	2600	67	1062
8	3300	91	1442
9	4000	104	1648

LED Display – **Code „3“**

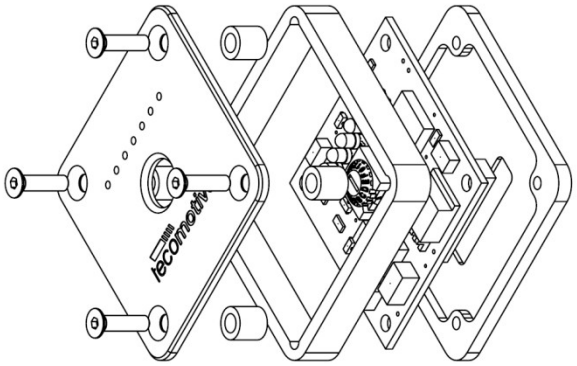
There is a seven LED display right above the rotary switch.
In factory setting this will show you the measured temperature.
(Six °C stepsize, first LED lights up at 6°C)

However you are able to change this so it shows you the actual pump speed.

In step 7 of the setup procedure, just choose one of the settings beside.

Rotary switch position	LED Display
0	Speed of the pump
1	Coolant temperature

E.g.: If you want to change the display to show the coolant temperature.
The 5 digit code is: “0” – “4” – “2” – “3” – “1”
(0423 for this menu and 1 for the new setting)



Delayed shutdown – **Code „6“**

After the ignition key is turned off the controller will check the coolant temperature once again. If it is still in the controlled range the delayed shutdown mode will kick in.

This mode is divided in two steps of one minute each.
In the first minute the pump will go to its full speed and the radiator fan will come on.
In the second step the pump speed is reduced to about 50% and the radiator fan is turned off again.

After that or if the coolant temperature falls down below the controlled range, the delayed shutdown feature will quit and the controller / pump will go into standby mode.

If you don’t need or want this feature you can deactivate it.
By doing so, the controller / pump will go directly into standby mode if the ignition key is turned off.

In step 7 of the setup procedure, just choose one of settings beside.

Rotary switch position	Delayed shutdown
0	Off
1	On

E.g.: If you want to deactivate the delayed shutdown
the 5 digit code is: “0” – “4” – “2” – “6” – “0”
(0426 for this menu and 0 for the new setting)

Boost Feature – **Code „9“**

To calculate the optimal pump speed the controller is measuring not only the current coolant temperature but also looks at how fast the temperature is rising.

If the temperature rises too fast to counteract with the normal control algorithm the controller will boost the pumps speed to its maximum in order to get it under control.
But in some few cases this can cause a saw tooth like effect where the pumps speed is quickly changing from high to low and back again.
If this happens you should deactivate this feature to take it easy on the pumps life span.

In step 7 of the setup procedure, just choose one of the settings beside.

Rotary switch position	Boost feature
0	Off
1	On

E.g.: If you want to deactivate the Boost feature
the 5 digit code is: “0” – “4” – “2” – “9” – “0”
(0429 for this menu and 0 for the new setting)

The factory setting here is “On”.

Reset to factory settings – **Code „F“**

You can always reset the whole controller to its factory settings.

In step 7 of the setup procedure, just choose the **“1”** for this.
The controller will then overwrite all the previous settings with the ones in the table below.

So the 5 digit code for this is:
“0” – “4” – “2” – “F” – “1”
(042F for this menu and 1 for the reset)

Factory settings:

Name	Setting
Minimum pump value	600rpm (15 l/min) (CWA200)
LED Display	Displays the temperature
Delayed shutdown	Delayed shutdown activated
Boost feature	Boost feature activated

Specifications Controller

Name:	Tecomotive „tinyCWA“
Dimensions:	51x51x13mm (without connector) 51x51x24mm (with connector)
Operating voltage:	8 to 16 Volts
Current consumption:	max. 20mA about 1.5mA in Standby mode
Temperature range:	-40°C to +100°C (-40°F to +212°F)
Weight:	about 40 grams (1.4 ounces)

Specifications Water pump

Name:	Pierburg „CWA200“
Dimensions:	100x125x175mm
Operating voltage:	8 to 16 Volts
Current consumption:	max. 15A 0,2mA in Standby mode
Speed:	18 to 4500rpm
Pump pressure:	0.45 bar
Volume flow:	116 l/min
Temperature range:	-40°C to +140°C -40°F to +284°F

Example part numbers:

Pierburg:
7.00294.17.0

BMW:
11 51 7 586 925

BMW old:
11 51 7 563 183
11 51 7 546 994
11 51 7 521 584
11 51 7 545 201

Safety notes

Disclaimer

The installation should only be done by experienced or special trained personnel with the necessary knowledge.
We cannot be held liable for any damages on your car, engine or the product itself!

General notes

Before you plug in the devices make sure all the cables are wired correctly!

The installation needs special automotive and electrical knowledge.
Improper connection and use can damage your car, the engine or the product itself.

Installation

Before you start with the installation disconnect the cars battery to prevent any unintentional short circuits.

Pay attention to any potential safety notes from your car manufacturer.
(E.g. regarding airbags, alarm systems, ECU's or immobilizers)

Avoid smoking, fire, flying sparks or static electricity charges.

Be careful not to damage any parts (e.g. battery, wires, hoses…) while drilling holes.

Don't lay cables or connectors in areas which are exposed to spray water.

Don't mount the wires / sensor in areas which are exposed to moving or rotating parts.

Operation

Any modifications on your car could be against the law.
It is your responsibility to get all the necessary information and permissions to drive the car legally.

If you drive your car without proper legality and permissions you could lose your insurance coverage and could be committing a criminal offence.

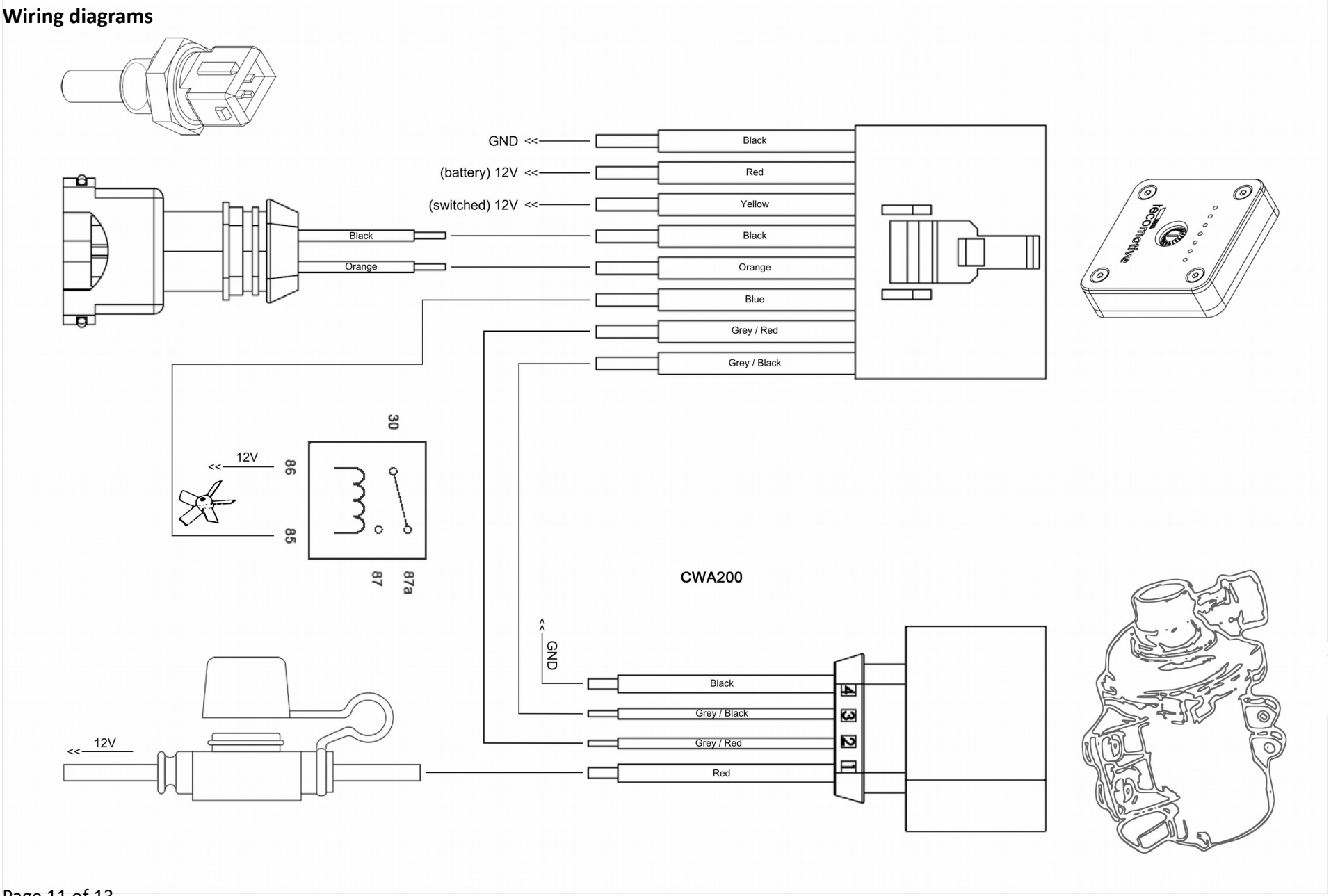
Current consumption over longer periods of time

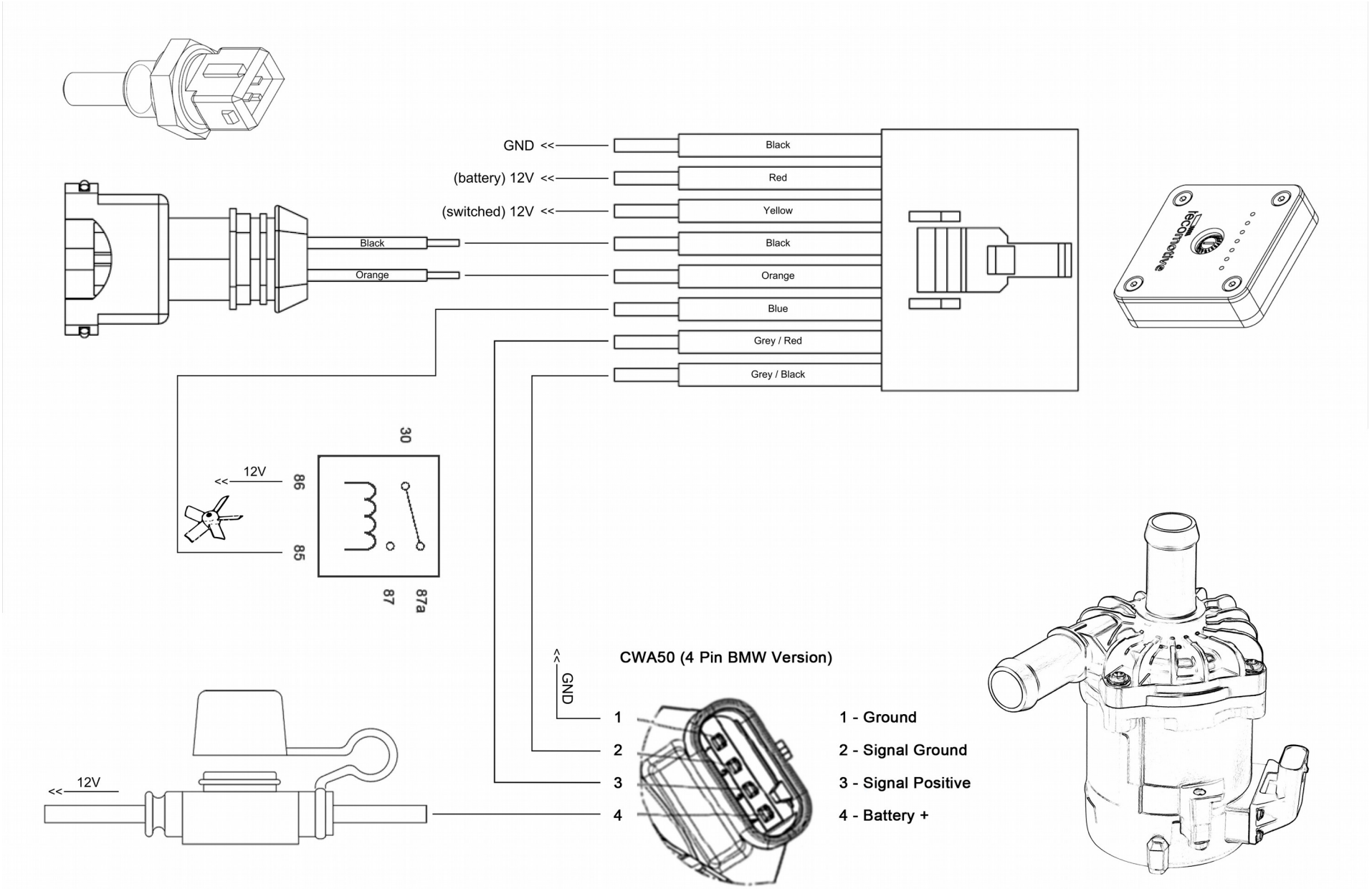
The devices are consuming a little bit of current even in standby mode.
If you don't use them over a longer period of time it is recommended to disconnect them entirely to not damage the cars battery.

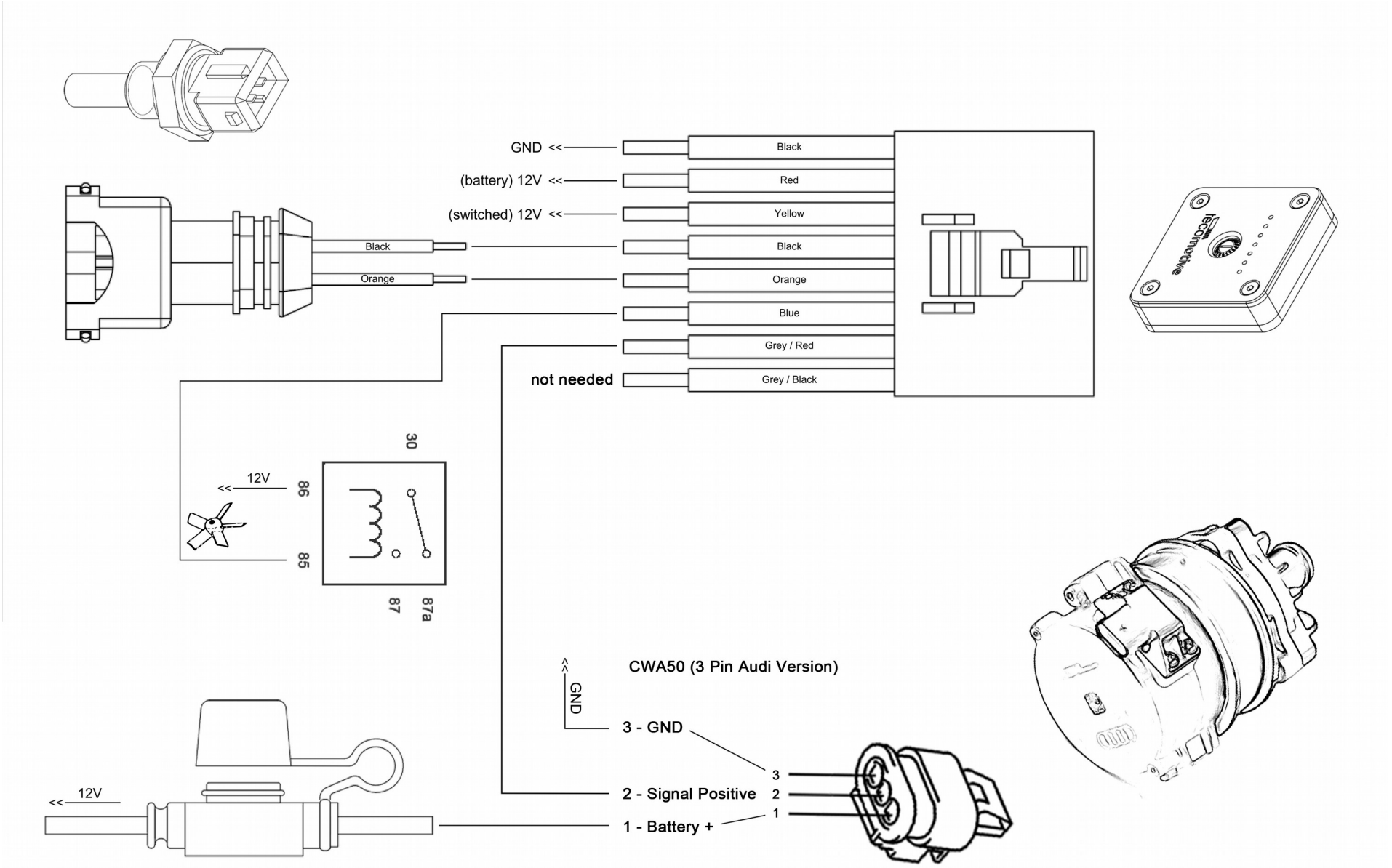
Application

The device described in this manual is only tested with the water pump "CWA200" made by the "Pierburg Pump Technology GmbH" which is available at the replacement department of the "BMW AG".
A functional guarantee can only be given by using this product.

Wiring diagrams




GND <<
(battery) 12V <<
(switched) 12V <<
Black
Red
Yellow
Black
Orange
Blue
Grey / Red
Grey / Black
Black
Orange
12V
86
85
30
87
87a
GND
CWA50 (4 Pin BMW Version)
1
2
3
4
1 - Ground
2 - Signal Ground
3 - Signal Positive
4 - Battery +
12V


GND <<
(battery) 12V <<
(switched) 12V <<
not needed
Black
Red
Yellow
Black
Orange
Blue
Grey / Red
Grey / Black
Black
Orange
12V
30
86
85
87
87a
CWA50 (3 Pin Audi Version)
GND
3 - GND
2 - Signal Positive
1 - Battery +
3
2
1
12V